

# ASSESSMENT OF THE IMPACT OF ISO STANDARDS – A STUDY OF CHINESE FIRMS

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**Abstract:** ISO 9000 has become a prerequisite for production and service companies. Several issues have been raised following the positive/negative effect of the ISO 9000 standard. The scholar has explored the significance of adopting the ISO 9000 standard in efforts to explain the companies' improvement in sales and profit. The average income and profit of non-ISO standard companies were significantly lower than that of ISO-certified Chinese companies. On the contrary, average ROS and ROA of ISO-certified companies were significantly lower than in non-ISO companies. The correlation between the profit of operation and ROA was significantly positive. It was noted that there was a reasonable positive correlation between ROS and profit, which was statistically significant. The relation between the educational qualification of employees and ISO adoption status was noted to be statistically significant. The management of non-ISO Chinese firms should adopt the ISO guidelines by implementing the standards. Inefficient utilization of operational facilities and assets in ISO firms was probably the cause of lower ROS and ROA of ISO-certified companies, and the management should focus on the ambiguities. The upcoming study can also include external factors, such as GST to assess the impact on ROS and ROA with structural equation modeling.

**Index Terms - ISO 9000, ROS, ROA, Chinese firms.**

## I. INTRODUCTION

### 1.1 Background

The ISO 9000 standard has been introduced by an increasing number of organizations around the world. Concern for managers has been always the implementation requirement and the impact on employees. The impact of this ISO standard on quality management and productivity improvement is broadly debated. Unfortunately, little is known about why should companies implement or resist the use of the ISO 9000 standard.

### 1.2 Purpose

ISO 9000 has become a prerequisite for production and service companies. Several issues have been raised following the impact of the ISO 9000 standard. Whether certification will help to improve the sale? Will the profit get improved? Will the return on asset and sales get improved? These topics were examined by analyzing data from the sample of 5717 Chinese service companies, among which 5257 companies were ISO 9000 certified between 2004 and 2008.

### 1.3 Research Objectives

This research has explored the significance of adopting the ISO 9000 standard in efforts to explain the companies' improvement in sales and profit. In doing so, the scholar examined the efficiency of the ISO 9000 system from seven different angles. The positive/negative impact of ISO certification on sales, profit, return on assets (ROA), and return on sales (ROS) have been scrutinized.

### 1.4 Format

This report discusses the background literature to construct the foundation. In the methodology section, the scholar has explained the approach of the research. Data analysis results have been elaborately discussed with descriptive and inferential results. The report comprises specific managerial advises and concludes with future scope of exploration.

## II. LITERATURE REVIEW

Earlier studies have underlined the need for internalization in particular when revising the ISO 9000 standard [8]. This is because it is a process of incorporating hidden and explicit information into the organization and translating it into knowledge [3]. Researchers also noted that the proposed QMS by ISO 9000 can be used to keep information coding that can promote data storage and knowledge transfer [5]. Previous findings show that researchers need to pay more attention to the demands of the company's actual implementation of standards, not just certification [9]. Authentication is a form of symbolic behavior that differs from the implementation of authentication policies. While previous studies have also shown that companies can implement management systems instead of not being certified, and some certification companies can exceed the standard requirements [1].

Empirical research to check the impact of ISO certification is not ultimate. Some researches show a strong impact of the ISO certification on the company's operations [12]. A positive correlation between the ISO certification and the business performance of empirical research is not always significant [7]. Generally, it is expected that the company's performance will improve significantly after the introduction of ISO 9000 certification. However, empirical evidence related to ISO certification and business results does not produce conclusive results. In some studies, some evidence is found that confirms that ISO certification and the company's market value and performance are positively correlated [6]. After ISO certification, the business and economic performance of Spanish companies were observed to improve significantly and positively after the announcement of ISO Certification [3].

Following the adoption of economic reforms and the Open Door policy 1978, China has become an important player in the global economy. The pace of internationalization in China has left a very deep impression. The Chinese economy has changed a lot in the last three decades. 1978 economic reforms led to China's high economic growth and rapid industrialization [11]. China's GDP grows by nearly 10% per annum, the world's fastest-growing economy. The service sector is very important for the global

economy [4]. In the global economy and the current market competition, service companies are looking for developing a prudent internal management system and implementing its internationally recognized management standards [10]. The ISO 9000 standard applies to large and small systems, private and public, industry, trade, and service organizations [13].

This study restricts itself on reviewing the impact of ISO 9000 implementation on revenue, profit, return on sales and return on assets. Chinese companies were taken into the consideration, and a comparative exploration has been prepared for ISO complaint and non-ISO firms. Seven under mentioned hypotheses have been verified with the help of descriptive and inferential analyses.

Hypotheses:

- The average revenue earned by the companies is higher in ISO certified Chinese companies.
- The average profit earned by the company is higher in ISO certified Chinese companies.
- The average return on sales in ISO certified companies is higher than non-ISO organizations.
- The average return on assets in ISO certified companies is higher than non-ISO organizations.
- Average ROA and ROS in ISO certified companies vary across the industry category.
- Revenue, profit for operating, ROS, and ROA have significant pairwise correlations.
- The educational qualification of employees is related to ISO adoption status.

### III. METHODOLOGY

#### 3.1 Sample Characteristics

A total of 5717 companies belonging to the Chinese service industry were selected from the database of 2008, published by the National Bureau of Statistics of China. An economic census of the service firms was conducted, where ISO 9000 standard certified and listed companies, as well as non-ISO companies, were selected. The 460 ISO certified companies got the certification between 2004 and 2008 [14, 15]. The selected 5715 companies belong to one of the industries: “Storage and Transportation”, “Telecommunication”, “Computer Service”, “Software”, “Business Services”, “Research and Development”, “Specialized Technology Services”, “Technology Exchange and Promotion”.

Employee strength, “numbers of employees with master or doctor degree”, bachelor degree, diploma, high school education, or junior high school indicate the staff strength and qualification of the employees. Sales figures, profit, total assets, equity, and total capital are some of the important variables. “Capital from the government”, overseas, and from other sources indicate the source of capital of the companies. Return on sales and assets, overseas investment, and age of the company were noted

#### 3.2 Variables of Interest

Following the hypotheses, the scholar restricted the scope of this article to evaluate the impact of ISO adoption on sales, profit, return on sales, and assets of the company. ISO status is an ordinal variable. Sales, profit, return on sales, and assets of the company are continuous variables (ratio variables).

#### 3.3 Design of the Study

Descriptive information of the sample for continuous as well as categorical variables has been evaluated. Based on the search direction of the hypotheses, inferential analyses have been conducted. Revenue, profit, ROA, and ROS are assumed to be normally distributed using Central Limit Theorem, as the number of observations in the sample was large enough ( $n > 30$ ). In the first four hypotheses, the average for revenue, profit, ROA, and ROS have been compared between ISO and non-ISO standard companies. In these cases, the t-test has been used for inferential analysis. The fifth hypothesis has been verified using the one-way ANOVA. Pearson’s correlation has been used to test the sixth hypothesis. Lastly, whether the educational qualification of employees was related to ISO adoption or not, has been tested using the chi-square test of independence.

### IV. ANALYSIS AND FINDINGS

#### 4.1 Descriptive Analysis

The 5717 companies in the sample were first categorized in ISO ( $N = 460$ ) and non-ISO firms ( $N = 5257$ ). These Chinese firms were also categorized under eight industry types. From Fig.2 it can be noted that the majority of firms were from business services and specialized technical services. The number of companies from the rest six industry types ranged between 184 and 392. The education level of the employees has been summarized separately for ISO and non-ISO compliant firms. In non-ISO companies, the average number of employees with master or doctor = 1.1, with bachelor degree = 9.5, diploma = 11.3, with high school education = 11.6, and with junior high school or below = 6.5. In ISO firms, average number of employees with master or doctor = 1.0., with bachelor degree = 19.5, with diploma = 16.0, with high school education = 6.0, and with junior high school or below = 0.0. ISO firms had more employees with higher qualifications. The claim has been later verified by inferential analysis using the Chi-square test of independence.

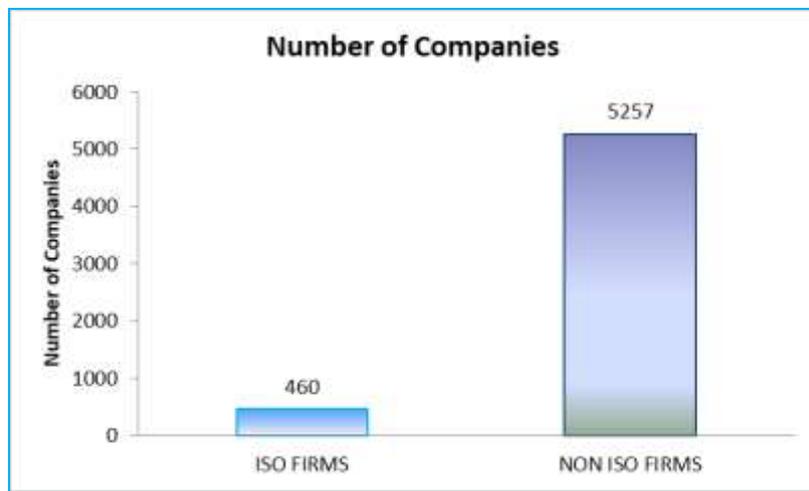


Figure 1: Division of companies on ISO standard

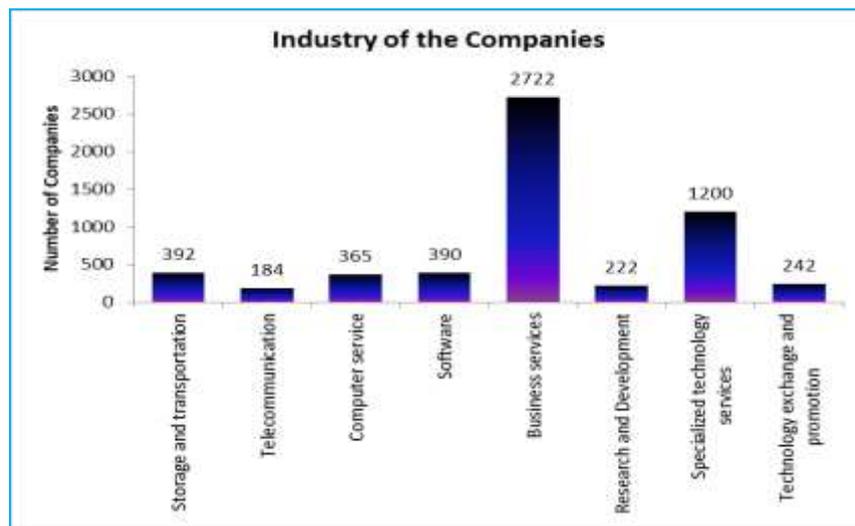


Figure 2: Division of companies based on industry type

Descriptive summary of employee strength, profit, and sales of the company, return on assets, and sales have been evaluated for ISO and non-ISO standard companies, and have been presented in Fig.3 and Fig.4.

Variables	M	SD	Min	Max	Median	IQR
Employee number	100.53	129.46	11.00	913.00	55.00	81.25
Sales of the company	29591.67	55356.92	1000.00	629516.00	10046.00	23407.00
Profit of the company	4384.67	9237.04	18.00	75004.00	1125.50	3516.25
Total asset of the company	33524.54	63491.07	1000.00	544060.00	10088.50	26022.25
Equity of the company	16772.57	33693.40	31.00	303459.00	5252.00	12929.75
Total capital	9267.01	18155.24	30.00	184000.00	3500.00	8047.50
Capital from government	1919.22	9187.62	0.00	140100.00	0.00	0.00
FDI	569.00	3953.45	0.00	49806.00	0.00	0.00
Capital from other sources	6778.79	15922.06	0.00	184000.00	3000.00	5000.00
Return on sales	0.15	0.12	0.01	0.50	0.11	0.16
Return on assets	0.17	0.17	0.01	0.95	0.11	0.17
Percentage of overseas investment	0.03	0.15	0.00	1.00	0.00	0.00
Age of the company	10.28	9.14	2.00	56.00	8.00	8.00

Figure 3: Descriptive Summary of ISO Certified Companies (Note: N = 460 firms were ISO compliant)

Variables	M	SD	Min	Max	Median	IQR
Employee number	40.10	65.26	11.00	969.00	21.00	23.00
Sales of the company	10132.88	29617.09	1000.00	869176.00	4000.00	6037.00
Profit of the company	1865.26	6911.27	17.00	296176.00	669.00	1139.00
Total asset of the company	14981.12	53574.92	1000.00	978548.00	3700.00	6652.00
Equity of the company	6899.36	30642.06	-1367.00	877989.00	1500.00	2893.00
Total capital	4371.79	16971.71	10.00	402110.00	1000.00	2120.00
Capital from government	1138.29	11427.34	0.00	402110.00	0.00	0.00
FDI	329.61	4650.86	0.00	150000.00	0.00	0.00
Capital from other sources	2903.90	11278.13	0.00	400000.00	1000.00	1620.00
Return on sales	0.19	0.12	0.01	0.51	0.18	0.20
Return on assets	0.23	0.21	0.01	1.02	0.16	0.25
Percentage of overseas investment	0.02	0.15	0.00	1.00	0.00	0.00
Age of the company	7.39	6.82	2.00	61.00	6.00	6.00

Figure 4: Descriptive Summary of non-ISO Certified Companies ( N = 5257 firms were non-ISO compliant)

#### 4.2 Inferential Analysis

The average revenue or sales earned by the ISO complaint companies was 29591.67 (SD = 55356.92), and for non-ISO firms average revenue was 10132.88 (SD = 29617.09). A t-test with 482 degrees of freedom implied that average revenue earned by non-ISO companies was significantly ( $t = -7.45, p < 0.05$ ) lower than ISO certified Chinese companies.

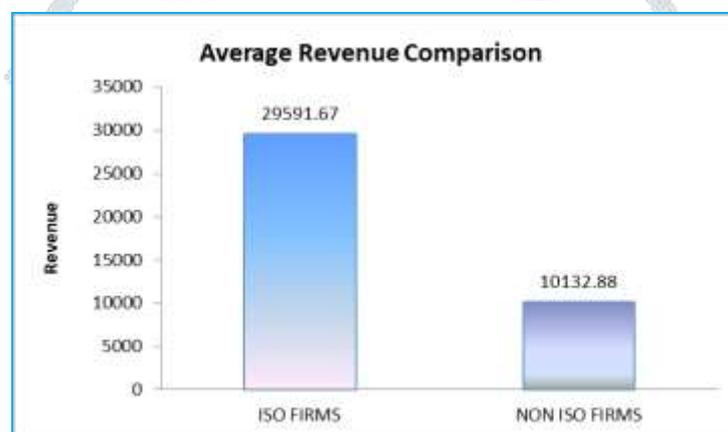


Figure 5: Comparison of revenue between ISO and non-ISO companies

The average profit earned by the ISO standard company was 4384.67 (SD = 9237.04), and for non-ISO compliant companies, the average profit was 1865.26 (SD = 6911.27). The t-test with 505 degrees of freedom indicated a significantly ( $t = -5.71, p < 0.05$ ) lower profit in non ISO certified Chinese companies compared to the ISO complain companies.

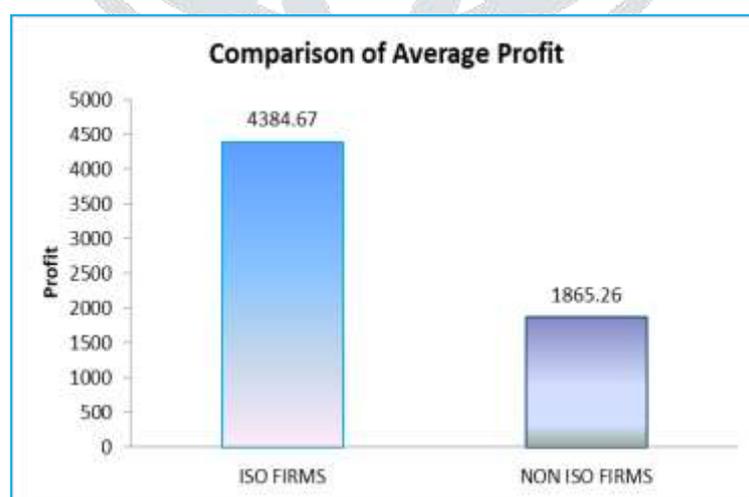


Figure 6: Comparison of profit for operating between ISO and non-ISO companies

Average return on sales in ISO certified companies ( $M = 0.15, SD = 0.12$ ) was lower than non ISO organisations ( $M = 0.19, SD = 0.12$ ). This difference was tested by t-test and found to be statistically significant ( $t = 6.72, p < 0.05$ ), indicating a higher average ROS for non ISO firms.

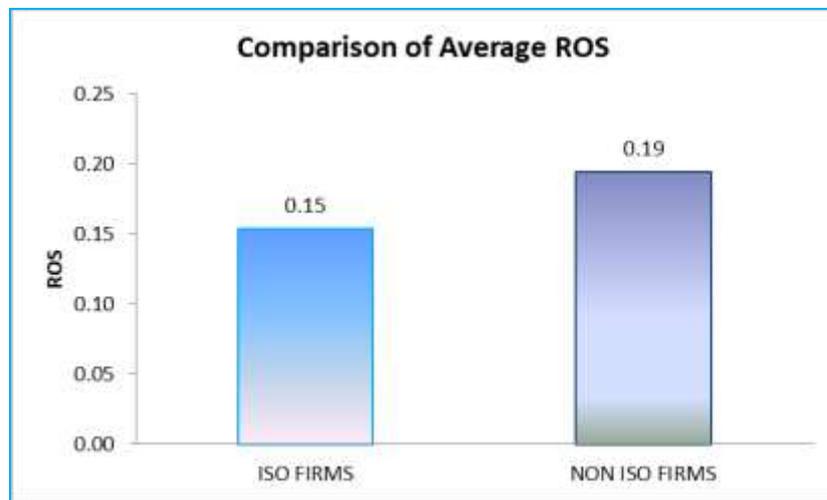


Figure 7: Comparison of ROS between ISO and non-ISO companies

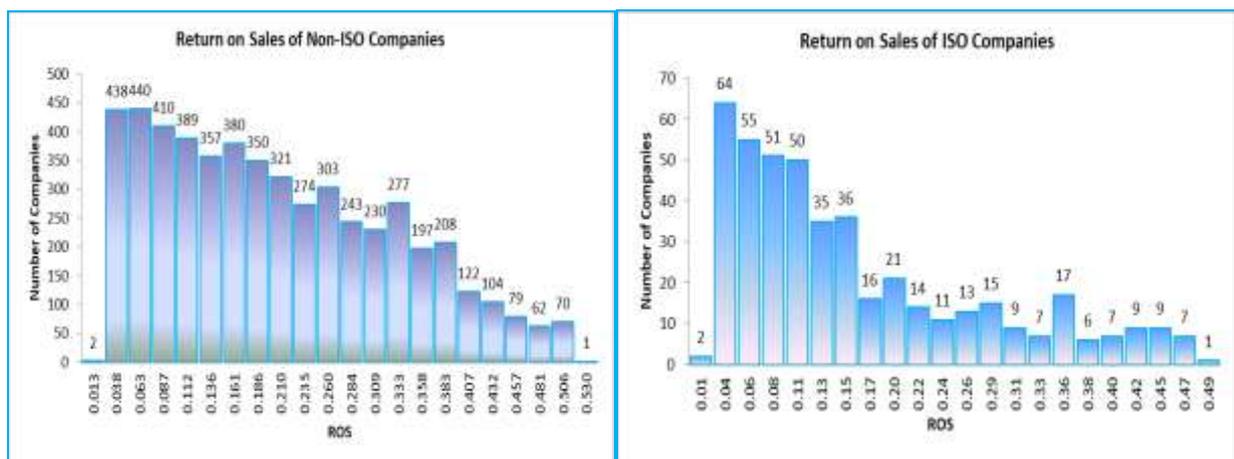


Figure 8: Distribution of ROS for ISO and non-ISO companies

Average return on assets in ISO certified companies ( $M = 0.17$ ,  $SD = 0.17$ ) was lower than non ISO organisations ( $M = 0.23$ ,  $SD = 0.21$ ). This difference was tested by t-test and found to be statistically significant ( $t = 7.37$ ,  $p < 0.05$ ), indicating a higher average ROA for non ISO firms at 5% level of significance.

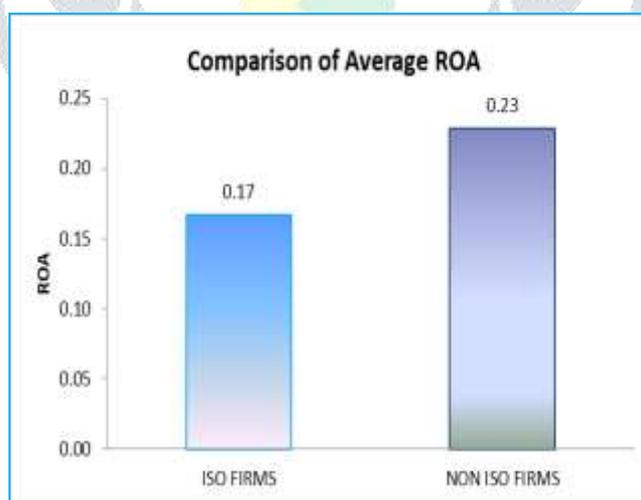


Figure 9: Comparison of ROA between ISO and non-ISO companies

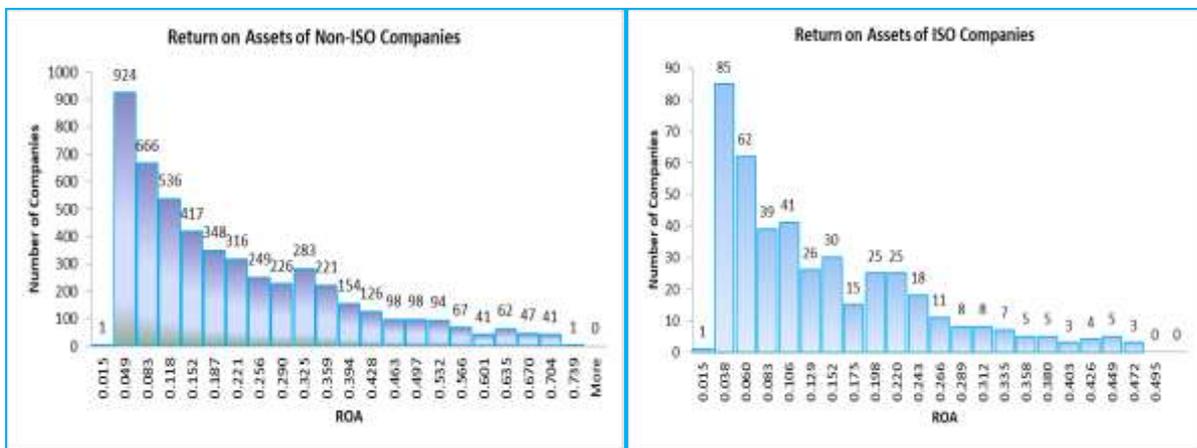


Figure 10: Distribution of ROA for ISO and non-ISO companies

Average ROA in ISO certified companies varies across the industry category. A one-way ANOVA found no significant differences ( $F = 1.16, p = 0.323$ ) between the average ROA of ISO standard firms. Average ROS in ISO certified companies also vary across different industry categories. A one-way ANOVA found at least one industry with significantly different average ROS ( $F = 3.89, p < 0.05$ ). Pairwise comparison using Tukey's test yield that there was a significant difference between the average ROS of software and the specialized technology services industry with ISO standard. Correlation between Revenue and profit for operating ( $r = 0.71, p < 0.05$ ) was significantly high positive. Likewise, correlation between ROS and ROA ( $r = 0.61, p < 0.05$ ) was significantly high and positive. A moderate but significantly positive correlation between ROS and profit ( $r = 0.35, p < 0.05$ ), and between ROA and profit ( $r = 0.27, p < 0.05$ ) were significant. The association between ISO adoption status and educational qualification of employees was tested by the "chi-square test of independence". A statistically significant association between the educational qualification of employees and ISO adoption status ( $\chi^2 = 7417.98, p < 0.05$ ) at a 5% level of significance.

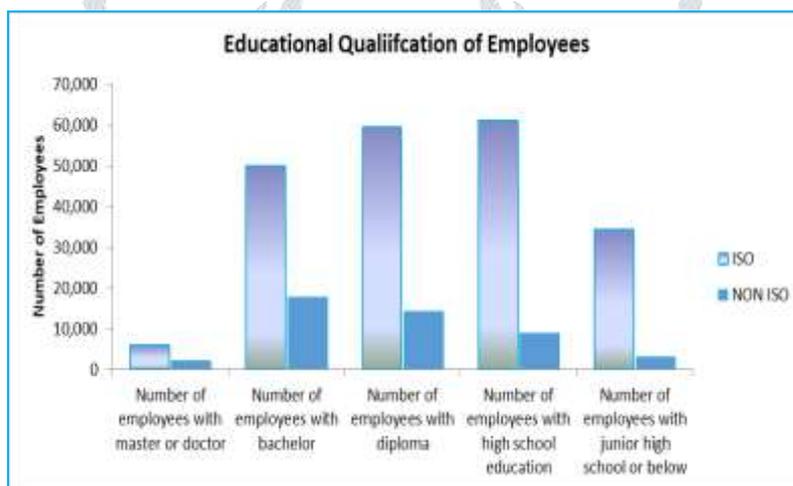


Figure 11: Comparison of educational qualification between ISO and non-ISO companies

**V. DISCUSSION**

The average income and profit of non-ISO companies were significantly lower than that of ISO-certified Chinese companies. This information was in line with previous literature. The management of non-ISO Chinese firms should adopt the ISO guidelines by implementing the standards [12]. The average ROS and ROA of ISO-certified companies were significantly lower than in non-ISO companies. This information was contradictory with the previous results [7]. Inefficient utilization of operational facilities and assets in ISO firms were probably two reasons, and the management should focus on this issue. The correlation between the profit of operation and ROA was significantly positive. It was noted that there was a reasonable but significant positive correlation between ROS and profit [6]. The service sector is very important for the global economy [4], and the present ISO companies should look for developing a prudent internal management system utilizing the operational facilities and assets.

**VI. LIMITATIONS AND SCOPE**

The present research was focused on the profit and sales of the firms, and a comparative approach was considered to differentiate between the ISO and non-ISO companies. The impact of FDI and the size of the company were not considered for this exploration. Future research could assess the impact of FDI on the profit and sales of a company along with its ISO status. No variable was related to external factors such as the tax structure of the country [2]. The upcoming study can also include external factors to assess the impact on ROS and ROA with structural equation modeling.

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